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Green Chemistry: Minimal Negative Effect On The Surrounding Ecosystem

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ABSTRACT:

The industrial revolution increased our general standard of living. To improve human longevity, it produced a large number of life-improving objects. The Industrial Revolution led to a rise in global production. a higher production rate in addition to serving as a source raw material intended for rapid consumption. No one believes that hundreds of tons of garbage damage the air, water, and land, not even consumers, scientists, or companies in the hazardous industrial sector. In the linear structure of the economy, the only metric used to quantify success was the success of the completed work, without regard for the legacies that were left behind. Soon, it will be hard to disregard significant environmental challenges, industry associations, and waste that has an effect on the environment. The green movement, which began with my community's growing awareness of the need to safeguard the environment, has expanded in waves to become one of the defining phrases of the 20th century. The green movement involves trash reduction, reuse, and recycling. During the 90s, the chemical industry was also affected by ongoing research into green chemistry, which ultimately led to the realization of manufacturing and training initiatives. Through the implementation of green chemistry concepts, the chemical industry has begun to protect the environment and conduct more sustainable practices. For a growing population in a society with limited resources in the twenty-first century, one of the most prevalent concepts in green chemistry is the concept of progress. To ensure that future generations inherit a habitable planet, it is essential to know green chemistry and green chemistry concepts and to implement these ideas.

Keywords: Environmental sustainability, Chemical pollution, Green Chemistry, Living environment

INTRODUCTION

Over the past century, chemistry has developed into a discipline that significantly contributes to modern life. Among the countless applications of chemistry in daily life, the pharmaceutical industry contributes the most to public life. With advancements in analgesics, antibiotics, cardiac medications, and most recently Viagra. Viagra is a very new addition to this list. It is difficult to imagine any part of modern life that has not been influenced in some way by products produced by the chemical industry and allied industries.

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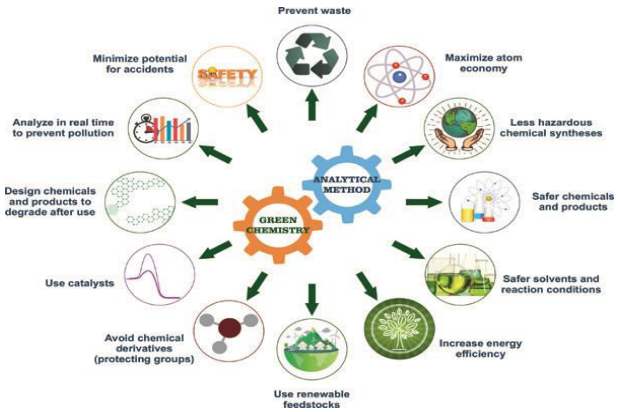

Figure-1- Application of chemistry in different industrial fields

The chemical industry contributes to other high-tech industries, such as biotechnology and telecommunications. This industry encompasses many chemical production methods and products, food, and basic necessities such as housing, health care, and computers. Due to the characteristics of the chemical industry and the locations where their goods are produced, the manufacturing technology necessary for the production of products, including this product, must be continuously updated. In a nutshell, chemical production must be founded on ongoing research and development (R&D). In recent years, chemical nanotechnology, biochemistry, catalysts, genetics, organic, and polymer chemistry have been the focus of scientific research. In 2013, the worldwide chemical industry's overall export value was around $5,1 trillion, or 28.9% of the entire global export value (18 billion US dollars). In the same year, the chemical sector accounted for 29.3% of worldwide imports with an import value of US$5.5 trillion, while global imports reached US$18.7 billion (ITC Trademap, 2014). In 1998, the chemical industry accounted for 7% of global GDP and 9% of global trade with revenues of $1.5 trillion. The output of the top 16 nations accounted for 80% of the global total. By the year 2020, it is anticipated that production will have increased by 85 percent compared to 1995 levels. At the close of the 20th century, population growth, depletion of natural resources, and technological breakthroughs all contributed to an increase in the. The chemical industry has emerged as the most significant environmental issue. People have been compelled to take preventive measures, especially when they fear the future. The chemical sector receives the lion's share of these measures because it is a critical component of the entire industry.

The chemical industry's "image" has become increasingly focused on the particular location of the problem in recent years. Public relations firms must work toward establishing rigorous entrance requirements if they want people to consider about smoking chimneys, polluted waterways, and fire and explosion hazards despite efforts to reduce pollution. Unfortunately, chemical plants will continue to be hazardous (poisonous) as long as they rely primarily on volatile organic solvents. Even if they entirely altered their solvents, this still holds true. In addition, there are no obstacles to the development of environmentally friendly chemical manufacturing techniques, despite an increasing global population and improving living standards (at least in one portion of the world). As production levels climb, businesses are working harder than ever to keep up with rising consumer demand. In this instance, the chemists believe that a novel strategy is required. In light of this, everyone should roll up their sleeves and prepare for the incorporation of ecologically friendly "green" chemistry into our knowledge of life. As little environmental damage as possible and, as a result, less restriction in the development of green chemistry, pollution, and the adoption of certain

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principles with the aim of minimizing as much as is practicable. In reality, none of these ideas are novel; what is novel is the order in which they are presented.

Despite the fact that chemistry has a significant positive impact on people's quality of life, the harmful effects of some chemicals on human health and the environment are not fully understood, despite the decades-long use of certain compounds. Each year, the environmental sector invests around $30 billion in research and development (R&D). Doble and Kruthiventi discovered that the optimal production strategy must incorporate at least one criterion.An ideal process is one that is fundamental, has only one step, is risk-free, employs renewable resources, is ecologically plausible, has a complete conclusion, generates no waste, is atom-efficient, and employs fundamental separation techniques. A great product. It has a smaller carbon footprint because it takes less energy and packaging, is totally biodegradable and recyclable, and poses no risk. In the majority of instances, the general public is preoccupied with the procedure and the end result, with little concern for the "ideal user." Also displays the qualities a perfect user should possess. A excellent example The customer is environmentally concerned, consumes as little as possible, recycles and reuses materials, is aware of the environmental impact of a product, and supports and promotes "green" initiatives (Dobl et al., 2007).

Pollution of the environment is one of the most pressing issues facing the world today, and pollution of the environment is one of the most important contributors to the discharge of chemicals, hazardous gases from industrial chimneys, water, and mixed solvents by nature. Environmental contamination produced by the most culpable substances, such as chemicals, has driven chemists and chemical engineers to explore novel solutions. In a world with an ever-increasing population and constrained resources, green chemistry is the most essential alternative strategy for attaining long-term success. This is because green chemistry uses fewer resources to get the same or better results.

In a chemical process, green chemistry aims to decrease or eliminate the usage of potentially hazardous compounds. In actuality, green chemistry is a movement that seeks to create alternatives to the usage of hazardous chemicals in manufacturing processes. Examples of hazardous chemicals are raw materials, reagents, solvents, products, and byproducts. Furthermore, it raises issues regarding the manufacturing process's long-term use of energy sources and raw materials Green Chemistry (EPA, 2016):

Atomic and molecular contamination must be stopped immediately.
Chemistry is more than a single subject; it is an overarching concept applicable to any field.
To address the world's environmental problems, novel scientific approaches are being employed.
Contributes to source reduction by minimizing the generation of pollutants and mitigating the potential adverse effects of chemical products and processes on human health and the natural environment.

To develop techniques that reduce the risks associated with chemical products and processes, while simultaneously removing the dangers posed by existing products and processes.

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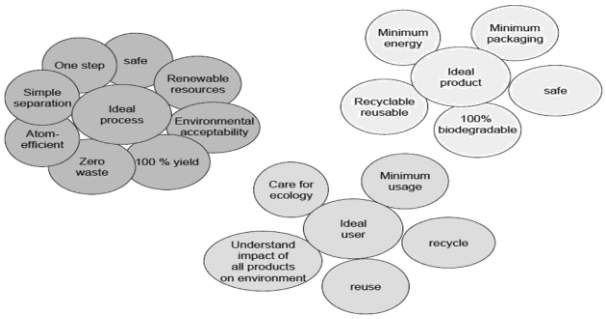

Figure-2-Product, manufacturing, and user criteria

The Development of Eco-Friendly Chemistry

The Environmental Protection Agency (EPA) of the United States invented the phrase "green chemistry" to characterize a long-term reconstruction of chemistry and chemical technology by industry, academia, and government. This was done to protect the environment. In the same year, 1995, the first edition of the United States Presidential Green Chemistry Challenge was held. Other countries in the world established their own versions of the prize in imitation of Europe. Alternatively, the International Union of Pure and Applied Chemistry (IUPAC) created a Green Chemistry Working Group The Green Chemistry Institute (GCI) was created approximately nine months following this IUPAC effort to promote collaboration between government, industry, academic, and research institutions. The Green Chemistry Initiative (GCI) was established to promote "green chemistry." Since 1997, when the first conferences on eco-friendly chemistry were conducted in Washington, they have become a popular academic activity. Washington hosted the inaugural meeting of its kind. In the 1990s, groundbreaking books and papers on green chemistry were published for the first time. Clean Processes and Products by Springer-Journal Verlag and Green Chemistry by the Royal Society of Chemistry are two of the most well-known of these publications in the modern period. However, parts on green chemistry have been published in a number of other publications, including Environmental Science and Technology and the Journal of Chemical Education.

Core Concepts of Environmentally Friendly Chemistry

After defining "green chemistry," Paul T. Anastas and John C. Warner went on to construct a total of twelve guiding principles that form the basis of the green chemistry methodology. These concepts serve as the cornerstone of the green chemistry methodology. These broad concepts, in addition to the individuals who will be working on this subject matter, will be taken into consideration.

Table-1 The12 principles of green chemistry

	Belongings
1	Eliminate the need to treat or clean up waste after it has already been produced by taking preventative measures to avoid creating waste in the first place.
2	Atomic economy refers to the planning of synthetic methods in order to achieve the highest possible rate of incorporation of all components used in the process into the end product.
3	Create chemical synthesis processes that are less hazardous In situations when it is possible to do so, synthetic methods ought to be figured out in order to use and create materials that cause very little or no toxicity to humans or the environment.
4	Create safer products and chemicals, Chemical products should be developed in a way that allows them to perform their intended function while minimizing the damage they cause.
5	Improved and less hazardous solvents and auxiliary chemicals, Whenever possible, the usage of auxiliary substances (such as solvents or separation agents) should be rendered unnecessary, and when they are employed, they should be harmless.

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6	Improve energy efficiency by comparing the environmental and economic impacts of chemical processes and lowering their energy needs. Synthetic processes should closely mimic natural temperature and pressure.
7	Whenever it is technically and economically viable, use renewable raw materials. In such a situation, a raw material or feedstock must be renewable rather than consumed.
8	Avoid chemicals, Unnecessary derivatization, including blocking groups, protection-protection, and non-permanent changes to physical chemical procedures, should be limited or avoided whenever possible.
9	Utilize catalysts rather than stoichiometric reagents. Catalytic reagents designed to be as optional as feasible with respect to stoichiometric reagents.
10	Chemical items should degrade into harmless degradation products after usage and not remain in the environment.
11	Real-time analyses prevent product contamination. Analytical techniques must be improved to allow real-time, in-process tracking and control before the formation of harmful chemicals.
12	Substances and forms utilized in chemical procedures should be chosen to reduce the risk of leaks, explosions, and fires.

GREEN CHEMISTRY UPSIDES

The state of human health:

There is a decrease in the amount of potentially harmful substances that are released into the atmosphere, which leads to less damage being done to lung tissue. The discharge of fewer potentially harmful chemical contaminants into water bodies results in cleaner water that can be used for drinking and other recreational purposes. Enhanced safety measures for workers in the chemical industry reduced contact with potentially harmful substances, less need for preventative gear, and a lower chance of injury in the event of an accident are all benefits of this change (e.g., fires or explosions) Products that are in every way safer for the general population to use including: There will be a reduction in the amount of waste produced during the production of certain goods, such as medications, while other goods, such as pesticides and cleaning chemicals, will be substituted with safer alternatives. Safer food as a result of the elimination of persistent toxic chemicals that can infiltrate the food chain and the use of safer pesticides that are only poisonous to specific types of pests and disintegrate rapidly after use. This will result in the elimination of persistent toxic chemicals that can infiltrate the food chain. decreased contact with potentially dangerous substances such as toxins that interfere with hormone production

Environment:

It is possible to release several chemicals into the environment in one of three ways: deliberately, as is the case with pesticides; inadvertently, as is the case with emissions produced during the manufacturing process; or through the disposal of waste. Green chemicals are defined as those that are either broken down into innocuous byproducts or recycled for use at a later time. The presence of toxic substances has less of an effect on the wellbeing of living things, including plants and animals. The dangers of ozone depletion, climate change, and smog production have been significantly reduced. There will be less interference from chemical agents in the ecosystems of the earth. The usage of landfills should be restricted, in particular for the disposal of hazardous waste.

The Business Sector and the Economy:

Increased product yields from chemical reactions with decreased starting material requirements to produce the same quantity of end product. Fewer steps in the manufacturing process, which typically leads to increased plant capacity, savings in energy and water, and quicker product output. Because of the decreased amount of material, there was no longer a requirement for costly remediation, the disposal of hazardous waste, or end-of-pipe treatments. Permit the utilization of waste products as an alternative to the acquisition of feedstocks. A decreased need for the product

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results from improved functionality that preserves its previous level of performance. A decrease in the consumption of products derived from petroleum slows the rate at which these resources are exhausted, which in turn lessens the associated dangers and the price volatility. a decrease in the size or footprint of a manufacturing plant as a direct result of an increase in the plant's throughput. The acquisition and display of a label that reflected a product's consumer safety led to an increase in sales (e.g., Safer Choice labeling) Enhanced levels of competitiveness on the part of chemical manufacturers as well as the businesses that use their products.

CONCLUSION

The study considered in light of present conditions, fundamental ideas such as dwindling resources, wastes that harm the environment, waste reduction strategies, the utilization of renewable energy sources, and life cycle studies have taken on more significance. When planning for a sustainable future in the globalized world of the twenty-first century, it is essential to evaluate the possibility of employing green chemistry. This is because green chemistry is less harmful to the environment than conventional chemical processes. In these specific conditions, the architects and engineers of future firms are anticipated to develop environmentally friendly products and procedures. Since atomic and molecular solutions to environmental problems are necessary for long-term development, green chemistry is one of the keys to sustainable growth. The purpose of green chemistry is to develop a new chemistry practice that satisfies certain needs and gives solutions to current problems facing humanity, such as climate change. Concerns include sustainable agriculture, the need for energy, the presence of toxic substances, and the utilization of natural resources, as well as the development of novel chemicals and techniques that restrict the manufacturing and application of hazardous items. Therefore, eco-friendly chemistry is an indispensable tool for the development of sustainable business operations. As chemists, it is our duty to examine the potential adverse effects of our work on human health and the natural environment. In a world where the concept of development in the twenty-first century is one of the most significant ideas of green chemistry, a sustainable future is one of the most important factors to consider in a society with a growing population and diminishing resources. The primary objective of the academic field known as "green chemistry" is the creation of chemical processes and molecules with the aim of minimizing their influence on the natural environment. Green chemistry provides economic benefits by executing the reaction of the new reality, which decreases production costs and conserves energy by executing highly efficient reactions at lower temperatures. Additionally, green chemistry offers benefits that can be achieved by embracing the new reality. Green chemistry not only offers practical answers in the areas of economics and energy, but it also reduces the risk of accidents by decreasing the amount of waste generated during chemical processes. This is due to the fact that the front legs of the advancing response are currently in the neighborhood of a safe path. This is the justification for the result. The international community will play an active role in pollution control in our country and is actively engaged in a wide range of applications. Green chemistry is a revolutionary approach to protecting both human health and the natural environment. To ensure that future generations inherit a habitable world, it is essential to have a thorough understanding of green chemistry and green chemistry principles, as well as to implement these ideas. This can be achieved by implementing these suggestions immediately. It is highly recommended that all degree programs in the field of chemical sciences incorporate green chemistry principles and practices within their curricula. If you do this, you will contribute to the growth and success of green chemistry in the future. This is how future generations will receive the knowledge.

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